

## CLAIMS

1           1. A method of automatically reallocating previously removed frequencies to be  
 2   used as allocated frequencies in order to maintain traffic capacity in a wireless commu-  
 3   nication system operable for automatic frequency allocation wherein each removed fre-  
 4   quency has an associated penalty time and interference level, the method comprising:

5                 determining if a number of allocated frequencies is less than a minimum  
 6   number of allocated frequencies required to maintain traffic capacity;

7                 selecting a proposed group of frequencies having the lowest acceptable  
 8   interference levels if the number of allocated frequencies is less than the mini-  
 9   mum number;

10                selecting a final group of frequencies from the proposed group of frequen-  
 11   cies by placing in the final group, the frequencies from the proposed group that  
 12   have the shortest acceptable penalty times; and

13                reallocating frequencies in the final group of frequencies.

1           2. The method of claim 1 wherein selecting the proposed group of frequencies  
 2   having the lowest acceptable interference levels from among available frequencies fur-  
 3   ther comprises:

4                 selecting a starting group of frequencies having the lowest interference  
 5   levels; and

6                 selecting the proposed group of frequencies from the starting group of fre-  
 7   quencies, wherein each frequency in the proposed group of frequencies has an  
 8   interference level below a maximum acceptable interference level.

3. The method of claim 1 wherein selecting the final group of frequencies from the proposed group of frequencies by placing in the final group, the frequencies from the proposed group that have the shortest acceptable penalty time further comprises:

selecting an intermediate group of frequencies from the proposed group of frequencies by placing in the intermediate group, the frequencies from the proposed group that have the shortest penalty time; and

selecting the final group of frequencies from the intermediate group of frequencies, wherein each frequency in the final group of frequencies has a current penalty time below a maximum acceptable penalty time.

4. The method of claim 2 wherein selecting the final group of frequencies from the proposed group of frequencies by placing in the final group, the frequencies from the proposed group that have the shortest acceptable penalty time further comprises:

selecting an intermediate group of frequencies from the proposed group of frequencies by placing in the intermediate group, the frequencies from the proposed group that have the shortest penalty time; and

selecting the final group of frequencies from the intermediate group of frequencies, wherein each frequency in the final group of frequencies has a current penalty time below a maximum acceptable penalty time.

5. Apparatus for automatically reallocating previously removed frequencies to be used as allocated frequencies in order to maintain traffic capacity in a wireless communication system operable for automatic frequency allocation wherein each removed fre-

quency has an associated penalty time and interference level, the apparatus comprising:

means for determining if a number of allocated frequencies is less than a minimum number of allocated frequencies required to maintain traffic capacity;

means for selecting a proposed group of frequencies having the lowest acceptable interference levels;

means for choosing a final group of frequencies from the proposed group of frequencies by placing in the final group, the frequencies from the proposed group that have the shortest acceptable penalty times; and

means for reallocating frequencies in the final group of frequencies to be used as allocated frequencies.

6. A programmed radio exchange operable for automatic frequency allocation wherein a frequency with an interference level is removed for an associated penalty time from an allocated set of frequencies when interference is detected on the frequency, the exchange further being enabled by a computer program to automatically reallocate previously removed frequencies to be used as allocated frequencies in order to maintain traffic capacity, the computer program comprising:

program code for determining if a number of allocated frequencies is less than a minimum number of allocated frequencies required to maintain traffic capacity;

program code for selecting a proposed group of frequencies having the lowest acceptable interference levels;

12                   program code for choosing a final group of frequencies from the proposed  
13                   group of frequencies by placing in the final group, the frequencies from the pro-  
14                   posed group that have the shortest acceptable penalty time; and  
15                   program code for reallocating frequencies in the final group of frequencies  
16                   to be used as allocated frequencies.

1               7. The programmed radio exchange of claim 6 wherein the selecting of the pro-  
2               posed group of frequencies is accomplished by sorting available frequencies according  
3               to interference level and selecting only those frequencies which have both lowest inter-  
4               ference levels and interference levels below a maximum acceptable interference level.

1               8. The programmed radio exchange of claim 6 wherein the selecting of the final  
2               group of frequencies is accomplished by sorting available frequencies according to cur-  
3               rent penalty time and selecting only those frequencies which have both lowest penalty  
4               times and penalty times below a maximum acceptable penalty time.

1               9. The programmed radio exchange of claim 7 wherein the selecting of the final  
2               group of frequencies is accomplished by sorting available frequencies according to cur-  
3               rent penalty time and selecting only those frequencies which have both lowest penalty  
4               times and penalty times below a maximum acceptable penalty time.

10. A computer program product for enabling a radio exchange to automatically reallocate previously removed frequencies, each having an interference level and a penalty time, to be used as allocated frequencies in order to maintain traffic capacity, the computer program product comprising a computer program further comprising:

instructions for determining if a number of allocated frequencies is less than a minimum number of allocated frequencies required to maintain traffic capacity;

instructions for selecting a proposed group of frequencies having the lowest acceptable interference levels;

instructions for choosing a final group of frequencies from the proposed group of frequencies by placing in the final group, the frequencies from the proposed group that have the shortest acceptable penalty time; and

instructions for reallocating frequencies in the final group of frequencies to be used as allocated frequencies.

11. The computer program product of claim 10 wherein instructions for selecting of the proposed group of frequencies further comprises:

instructions for sorting available frequencies according to interference level and selecting only those frequencies which have lowest interference levels; and

instructions for selecting frequencies that have interference levels below a maximum acceptable interference level.

12. The computer program product of claim 10 wherein the instructions for selecting the final group of frequencies further comprises:

instructions for sorting frequencies in the proposed group of frequencies according to current penalty time and selecting only those frequencies which have lowest penalty times; and

instructions for selecting frequencies which have penalty times below a maximum acceptable penalty time.

13. The computer program product of claim 11 wherein the instructions for selecting the final group of frequencies further comprises:

instructions for sorting frequencies in the proposed group of frequencies according to current penalty time and selecting only those frequencies which have lowest penalty times; and

instructions for selecting frequencies which have penalty times below a maximum acceptable penalty time.

14. A wireless communication system enabled for automatic frequency allocation comprising:

at least one transceiver;

at least one scanner for measuring received signal strength (RSS) on one or more frequencies; and

a radio exchange system connected to the scanner and the transceiver, the radio exchange system further comprising a radio control unit operable to derive an interference sample for each frequency measured by the scanner and execute a reallocation process that determines if a number of allocated frequencies is less than a minimum number of allocated frequencies required to maintain

1           15. The wireless communication system of claim 14 wherein the radio exchange  
2   system further comprises a slow low pass filter disposed between the radio control unit  
3   and the reallocation process so that the interference levels are based on slow filtered  
4   RSS samples.